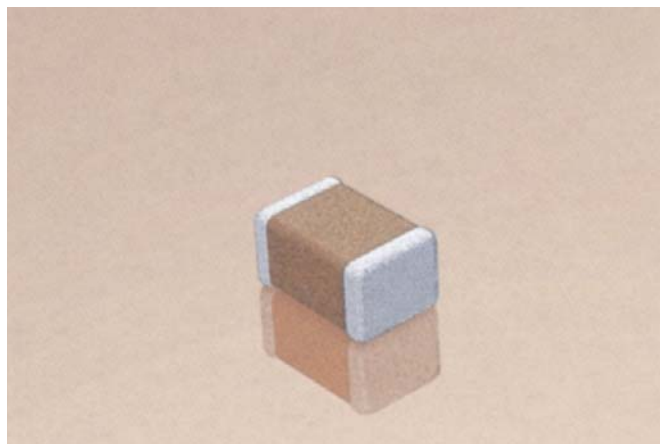


X7R Dielectric

General Specifications



X7R formulations are called "temperature stable" ceramics and fall into EIA Class II materials. X7R is the most popular of these intermediate dielectric constant materials. Its temperature variation of capacitance is within $\pm 15\%$ from -55°C to $+125^{\circ}\text{C}$. This capacitance change is non-linear.

Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency.

X7R dielectric chip usage covers the broad spectrum of industrial applications where known changes in capacitance due to applied voltages are acceptable.

PART NUMBER (see page 2 for complete part number explanation)

0805

Size
(L" x W")

5

Voltage
4V = 4
6.3V = 6
10V = Z
16V = Y
25V = 3
50V = 5
100V = 1
200V = 2
500V = 7

C

Dielectric
X7R = C

103

Capacitance Code (In pF)
2 Sig. Digits +
Number of Zeros

M

Capacitance Tolerance
J = $\pm 5\%$
K = $\pm 10\%$
M = $\pm 20\%$

A

Failure Rate
A = Not
Applicable

T

Terminations
T = Plated Ni
and Sn
7 = Gold Plated*
Z = FLEXITERM™**

*Optional termination

**See FLEXITERM™
X7R section

2

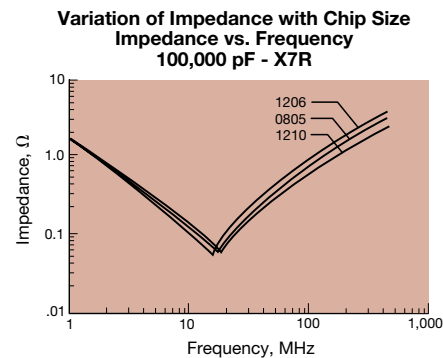
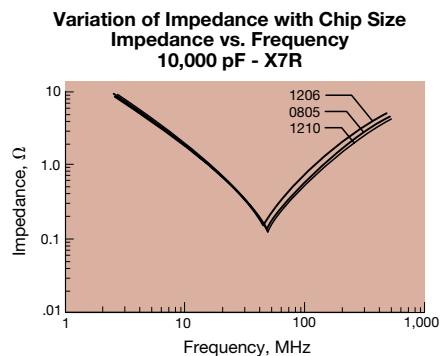
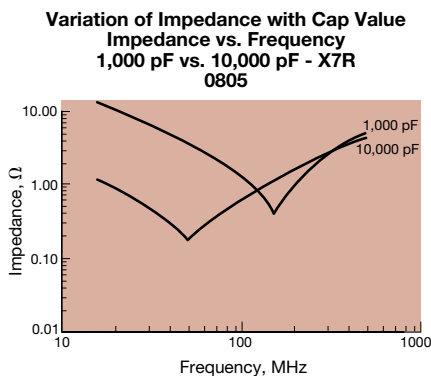
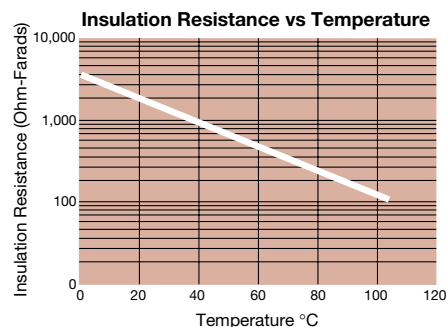
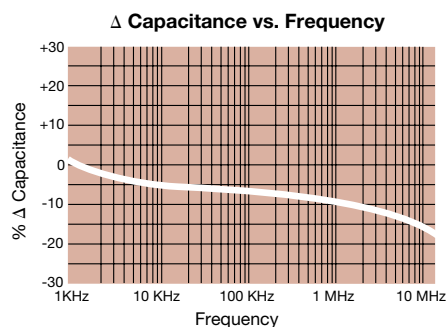
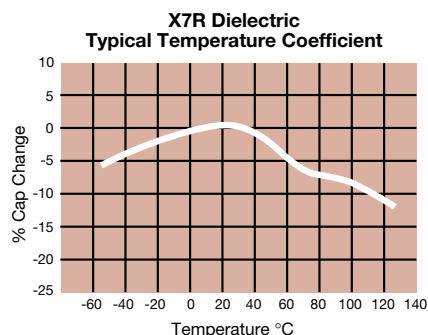
Packaging
2 = 7" Reel
4 = 13" Reel
7 = Bulk Cass.
9 = Bulk

A

Special Code
A = Std. Product

**Contact
Factory For
Multiples**

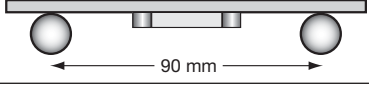
NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.



X7R Dielectric



Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$.2V For Cap > 10 μ F, 0.5Vrms @ 120Hz	
Dissipation Factor		$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 3.0% for 25V DC rating $\leq$ 3.5% for 16V DC rating $\leq$ 5.0% for $\leq$ 10V DC rating		
Insulation Resistance		100,000M Ω or 1000M Ω - μ F, whichever is less	Charge device with rated voltage for 120 $\pm$ 5 secs @ room temp/humidity	
Dielectric Strength		No breakdown or visual defects	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 1mm/sec 	
	Capacitance Variation	$\leq \pm 12\%$		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3		
Solderability		$\geq$ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 $\pm$ 5°C for 5.0 $\pm$ 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 $\pm$ 2 hours before measuring electrical properties.	
	Capacitance Variation	$\leq \pm 7.5\%$		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: -55°C $\pm$ 2°	30 $\pm$ 3 minutes
	Capacitance Variation	$\leq \pm 7.5\%$	Step 2: Room Temp	$\leq$ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125°C $\pm$ 2°	30 $\pm$ 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	$\leq$ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 $\pm$ 2 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage ($\leq$ 10V) in test chamber set at 125°C $\pm$ 2°C for 1000 hours (+48, -0) Remove from test chamber and stabilize at room temperature for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85°C $\pm$ 2°C/ 85% $\pm$ 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature and humidity for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

X7R Dielectric

Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE		0201		0402			0603						0805						1206									
Soldering		Reflow Only		Reflow Only			Reflow Only						Reflow/Wave						Reflow/Wave									
Packaging		All Paper		All Paper			All Paper						Paper/Embossed						Paper/Embossed									
(L) Length	MM (in.)	0.60 ± 0.03 (0.024 ± 0.001)		1.00 ± 0.10 (0.040 ± 0.004)			1.60 ± 0.15 (0.063 ± 0.006)						2.01 ± 0.20 (0.079 ± 0.008)						3.20 ± 0.20 (0.126 ± 0.008)									
(W) Width	MM (in.)	0.30 ± 0.03 (0.011 ± 0.001)		0.50 ± 0.10 (0.020 ± 0.004)			0.81 ± 0.15 (0.032 ± 0.006)						1.25 ± 0.20 (0.049 ± 0.008)						1.60 ± 0.20 (0.063 ± 0.008)									
(t) Terminal	MM (in.)	0.15 ± 0.05 (0.006 ± 0.002)		0.25 ± 0.15 (0.010 ± 0.006)			0.35 ± 0.15 (0.014 ± 0.006)						0.50 ± 0.25 (0.020 ± 0.010)						0.50 ± 0.25 (0.020 ± 0.010)									
WVDC		10	16	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
Cap (pF)	100	A	A																									
	150	A	A																									
	220	A	A			C																						
	330	A	A			C					G	G	G		J	J	J	J	J	J								K
	470	A	A			C					G	G	G		J	J	J	J	J	J								K
	680	A	A			C					G	G	G		J	J	J	J	J	J								K
	1000	A	A			C					G	G	G	G		J	J	J	J	J	J							K
	1500	A				C					G	G	G		J	J	J	J	J	J			J	J	J	J	J	M
	2200	A				C					G	G	G		J	J	J	J	J	J			J	J	J	J	J	M
	3300	A				C	C				G	G	G		J	J	J	J	J	J			J	J	J	J	J	M
	4700	A				C	C				G	G	G		J	J	J	J	J	J			J	J	J	J	J	M
	6800	A				C	C				G	G	G		J	J	J	J	J	J			J	J	J	J	J	P
	Cap (µF)	0.010	A			C	C					G	G			J	J	J	J	J	J			J	J	J	J	J
	0.015				C	C					G	G			J	J	J	J	J	J			J	J	J	J	J	M
	0.022				C	C					G	G	G		J	J	J	J	J	J	N		J	J	J	J	J	M
	0.033										G	G	G			J	J	J	J	N			J	J	J	J	J	M
	0.047										G	G	G			J	J	J	J	N			J	J	J	J	J	M
	0.068										G	G	G			J	J	J	J	N			J	J	J	J	J	P
	0.10										G	G	G			J	J	J	J	N			J	J	J	J	M	
	0.15										G	G				J	J	J	N				J	J	J	J	Q	
	0.22										G					J	J	J	N				J	J	J	J	Q	
	0.33															J	J	J	N				J	J	J	J	Q	
	0.47															N	N	N	N				M	M	M	P	Q	
	0.68															N	N	N					M	M	Q	Q		
	1.0								J	J						N	N	N					M	M	Q	Q		
	1.5																						M	Q	Q	Q		
	2.2							J											N				Q	Q	Q			
	3.3																						Q	Q	Q			
	4.7															P	P	P						Q				
	10																											
	22															P							Q					
	47																											
	100																											
	WVDC	10	16	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
SIZE		0201		0402			0603						0805						1206									
Letter		A	C		E			G		J			K		M		N		P		Q		X		Y		Z	
Max. Thickness		0.33 (0.013)	0.56 (0.022)		0.71 (0.028)			0.86 (0.034)		0.94 (0.037)			1.02 (0.040)		1.27 (0.050)		1.40 (0.055)		1.52 (0.060)		1.78 (0.070)		2.29 (0.090)		2.54 (0.100)		2.79 (0.110)	
	PAPER												EMBOSS															

 = Under Development

X7R Dielectric

Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE		1210								1812				1825				2220				2225																					
Soldering		Reflow Only								Reflow Only				Reflow Only				Reflow Only				Reflow Only																					
Packaging		Paper/Embossed								All Embossed				All Embossed				All Embossed				All Embossed																					
(L) Length	MM (in.)	3.20 ± 0.20 (0.126 ± 0.008)								4.50 ± 0.30 (0.177 ± 0.012)				4.50 ± 0.30 (0.177 ± 0.012)				5.70 ± 0.40 (0.225 ± 0.016)				5.72 ± 0.25 (0.225 ± 0.010)																					
(W) Width	MM (in.)	2.50 ± 0.20 (0.098 ± 0.008)								3.20 ± 0.20 (0.126 ± 0.008)				6.40 ± 0.40 (0.252 ± 0.016)				5.00 ± 0.40 (0.197 ± 0.016)				6.35 ± 0.25 (0.250 ± 0.010)																					
(t) Terminal	MM (in.)	0.50 ± 0.25 (0.020 ± 0.010)								0.61 ± 0.36 (0.024 ± 0.014)				0.61 ± 0.36 (0.024 ± 0.014)				0.64 ± 0.39 (0.025 ± 0.015)				0.64 ± 0.39 (0.025 ± 0.015)																					
WVDC		6.3	10	16	25	50	100	200	500	50	100	200	500	50	100	200	500	6.3	50	100	200	50	100	200	500	6.3	50	100	200	50	100	200	500										
Cap (pF)		100																																									
		150																																									
		220																																									
		330																																									
		470																																									
		680																																									
		1000																																									
		1500	J	J	J	J	J	J	M																																		
		2200	J	J	J	J	J	J	M																																		
		3300	J	J	J	J	J	J	M																																		
		4700	J	J	J	J	J	J	M																																		
		6800	J	J	J	J	J	J	M																																		
Cap (μF)		0.010	J	J	J	J	J	J	M	K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.015	J	J	J	J	J	J	P	K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.022	J	J	J	J	J	J	Q	K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.033	J	J	J	J	J	J		K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.047	J	J	J	J	J	J		K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.068	J	J	J	J	J	M		K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.10	J	J	J	J	J	M		K	K	K	K	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.15	J	J	J	J	M			K	K	K	P	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.22	J	J	J	J	P			K	K	K	P	M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.33	J	J	J	J	Z			K	M			M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.47	M	M	M	M	Z			K	P			M	M	M	M	X	X	X	X	M	P			X	X	X	X	M	P												
		0.68	M	M	P	X	Z			M	Q			M				X	X	X	X	M	P			X	X	X	X	M	P												
		1.0	N	N	P	X	Z			M	X			M				X	X	X	X	M	P			X	Z			M	P												
		1.5	N	N	Z	Z				Z	Z			M				X	X	X	X	M	P			X	Z			M	P												
		2.2	Z	Z	Z	Z				Z	Z			M				X	X	X	X	M	P			X	Z			M	P												
		3.3	Z	Z	Z	Z				Z																																	
		4.7	Z	Z	Z	Z				Z																																	
		10	Z	Z	Z																																						
		22	Z	Z																																							
		47																																									
		100																																									
WVDC		6.3	10	16	25	50	100	200	500	50	100	200	500	50	100	200	500	6.3	50	100	200	50	100	200	500	6.3	50	100	200	50	100	200	500	50	100	200	500						
SIZE		1210								1812				1825				2220				2225																					
Letter		A	C	E	G	J				K	M	N	P	Q	X	Y	Z																										
Max. Thickness		0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.86 (0.034)	0.94 (0.037)				1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)																										
		PAPER								EMBOSS																																	

= Under Development